[001] MODULAR TRACK SECTION FOR URBAN TRANSPORT VEHICLE IN PARTICULAR SELF-STEERING ON TYRES

[002]

[003]

[004] The present invention concerns a modular travel lane section for fixed guideway urban transportation vehicles rolling on tires, and a travel lane formed of a succession of a number of travel lane sections.

[005]

[006] In order to unblock the centers of cities, choked by the traffic of too many automobiles, present urban policy tends to develop mass transportation. The large municipalities thus equip themselves with more and more vehicles of the tramway, trolleybus or subway type.

[007] Among these, the fixed guideway tramways on tires are particularly advantageous for small to medium-sized cities. In fact, they can share the roadway with regular vehicles, requiring little infrastructure work, and can move about on relatively narrow streets. In addition, they have a much greater capacity then that of buses, they are rapid, and are not subjected to the hazards of city traffic.

[008] They must, however, roll on specially designed paths, consisting of rolling tracks, a guide rail, for example centered, and the installation of electrical energy feed, signals and other items. Thus, their installation in an urban milieu, in any event, requires a certain amount of work.

[009] In order to carry out this work, it is usually necessary to close off one or more streets for an extended period of time, the time to dig an adequate trench, divert the existing conduits and pipes, prepare the ground, pour the foundations, carry out surveys for each of the component elements of the lane, install and connect the different components, make the connections, fill in and lay out the areas adjacent to the components of the lane, resurface the roadway damaged by the work, lay out the crossings and the signals, etc...

[010] All this work obviously generates traffic, parking, supply and business access

problems as well as noise, dust, etc., which result in significant inconvenience to the inhabitants, the business people, as well as for all the users wishing to use the routes blocked by the work.

[011] It is therefore in the interest of everyone that the installation of the travel lane takes as little time as possible in order to reduce the inconvenience which it causes.

[012]

[013] The objective of the invention is thus to provide a travel lane with an installation that is simplified and which requires work that takes much less time.

[014] To resolve this technical problem, the travel lane according to the invention is in the form of prefabricated modular sections to be installed on prepared ground and assembled on site.

[015] Because of this fact, after the terrain is prepared, all that has to be done on site is to connector the sections to one another; create the branches as required, and to carry out the backfill, finishing and layout work. Many of the steps are carried out in the plant and no longer in the urban environment, which considerably reduces the time for field site work and the inconvenience it causes.

[016] In addition, the lane section, according to the invention, can be installed with its counterparts in a light overlay directly on an existing roadbed, or, for a travel lane that is at the same level as the roadway, on a terrain that is simply prepared and compacted without the need for foundations, which again significantly diminishes the time required for the field site work.

[017] According to the invention, the modular traffic lane sections for fixed guideway urban transportation vehicles on tires consists of a framework formed of two hollowed, shaped caissons, with a section that is more or less rectangular or trapezoidal, having a base that is more or less flat, and two lateral walls, respectively exterior and interior, the caissons maintained more or less parallel and connected by tie plate lacings which support, preferably in their median part, a guide rail designed to serve as a bearing for the guide rollers of the urban transportation vehicle.

[018] A more or less flat band serving as the rolling track for the vehicle wheels is connected to the upper part of these caissons.

[019] Advantageously, the interior space of at least one of these caissons is used for the passage of electrical cables, notably to supply the vehicle and/or auxiliary cables for signals, safety, communications or sources of heat for de-icing.

[020]

[021] Other characteristics and advantages of the intervention will become evident from the reading of the detailed description which follows, a description that makes reference to the attached drawings in which:

[022] Fig. 1 is a perspective overview of a first variation of a section of lane according to the invention installed by overlaying on an existing roadway;

[023] Fig. 2 is a perspective view of the first variation of a section of lane similar to Fig. 1, in which the guide rollers and two wheels of the urban transportation vehicle have been represented;

[024] Fig. 3 is a perspective view of the framework of a lane section according to the first variation of the invention;

[025] Fig. 4 is a cross-section of view of the framework of the lane section according to the first variation of the invention;

[026] Fig. 5 is an enlargement in perspective illustrating more specifically the section guide rail according to the first variation of the invention;

[027] Fig. 6 is a cross-section of the enlargement of Fig. 5 illustrating the guide rail of this section according to the first variation of the invention;

[028] Fig. 7 is an overview in perspective of a second variation of the lane section according to the invention, buried in a trench;

[029] Fig. 8 is a perspective view of the second variation of the lane section, similar to Fig. 7, in which the guide rollers and two wheels of the urban transportation vehicle are represented;

[030] Fig. 9 is a perspective view of the framework of the lane section according to the second variation of the invention;

[031] Fig. 10 is a cross-section view of the framework of the lane section according to the second variation of the invention;

[032] Fig. 11 is an enlargement in perspective illustrating more specifically the guide rail of the second variation of the invention;

[033] Fig. 12 is a cross-section of view of the enlargement of Fig. 11 illustrating the guide rail of the second variation of the invention;

[034] Fig. 13 is a perspective view of the framework of a lane section enabling the collection of electricity at ground level according to a third variation of the invention; and

[035] Fig. 14 is a cross-section view of the framework of the lane section according to the third variation of the invention.

[036]

[037] Several methods of implementation of lane section 1 will now be described in a detailed manner by making reference to Figs. 1 to 14. However, it must be clearly understood that these are only preferential variations of the invention, given by way of example, and not with the aim of limiting the scope which is defined by the appended claims. The various elements represented in the Figs. have the same numeric references.

[038] Each modular section 1 of the travel lane of an auto guided tramway on tires consists of a framework 2 made up of two tubular shaped caissons 3. These caissons 3 have a base, which is more or less flat 4, and two lateral walls, exterior 5 and the interior 6 respectively, thus delimiting an interior hollow space 7. They preferably have a section in the form that is more or less rectangular or trapezoidal, open on the upside.

[039] These shaped caissons 3 are closed at the upper part by a band 8 that is more or less flat, which serves as the right or left rolling track for the wheels 9 of the tramway on tires. The rolling track 8 consists for example of a succession of linear plates resting on the longitudinal raised edges 10 presenting, for example a return towards the interior of the upper extremities of the lateral walls 5 and 6 of the

caissons 3.

[040] In order to ensure a better support for the rolling track, transverse partitioning plates 11 could be provided within the interior of the caissons 3, providing additional support for the rolling track in the upper part.

[041] The band or rolling track 8 forming the rolling path is designed to form a load-bearing road, adapted to urban vehicle transportation traffic. Its form, its structure and the nature of the constituent materials are thus chosen in a manner to best realize this function. They can thus, for example, be metallic or preferably, to limit noise and avoid the phenomenon of heat accumulation in summer, be made of a reinforced synthetic material.

[042] In addition, the rolling track 8 must offer a good adherence to the tires 9 installed on the vehicle, regardless of weather conditions, for example in the event of rain or glaze ice. Advantageously, rolling track 8 can be structured in its upper part, with this upper surface having adhesion ribs 12, for example in chevrons in the represented methods of implementation.

[043] A noise insulating material is preferably inserted between the rolling track 8 and the shaped caisson 3 into which it is inserted. This material limits the level of sound associated with the passage of the vehicle, and can in addition, improve the watertight characteristic of the caisson.

[044] The linear plates constituting the rolling track 8 are joined in a detachable manner to the shaped caissons 3 in a way as to render possible access to their interior space 7.

[045] The interior space 7 of the hollow-shaped caissons 3 forms an interior volume in which to insert various parts, connections and functionalities. It is used, for example, for the routing of the lane's electrical feed cables, for example, for the collection of electricity at ground level, or to feed the catenary poles, and for the routing of auxiliary cables, notably those for signals, safety and communication.

[046] In this case, the transverse partition plates 11 have cutouts which enable the passage and local maintenance of cables by forming one or more compartments 13 within the interior space 7, for example, a single compartment for the variation

represented in Fig. 10, or two compartments separated by an upright 14 for that of Fig. 4.

[047] Housings 15 can be provided in these partitioning plates 11 to receive these cables. Their number, size and placement can vary as a function of the planned applications. These housings 15 are preferably distributed about the perimeter of the cut-outs created in the partitioning plate 11, notably at the level of their lateral edges as well as on the walls of the possible uprights 14 separating the compartments.

[048] The volume delimited by the lateral caissons can also serve as a hot air transport duct or for air heated locally, or to shelter the means of heating, or to serve as a container for the heated air conduits in order to avoid icing up, or to carry out de-icing of the rolling track.

[049] The interior space 7 of the caissons 3 can also be filled, for example by use of foam, after installation of the cables, so as to avoid the caissons amplifying the rolling noise of the vehicle by working as a resonance box.

[050] Evacuation orifices, not represented, possibly equipped with tubes, are advantageously provided in the lower part of these shaped caissons in order to evacuate, by means of a drainage network, rainwater likely to penetrate the interior of the caissons.

[051] The shaped caissons 3 are maintained more or less parallel to one another by the tie plate lacings 16 which connect them at intervals, preferably regular, and which are spaced apart by, for example, 1 meter.

[052] These tie plate lacings 16 preferentially support, in their median part, a guide rail 17 designed to serve as a rolling path for the guide rollers 18 for guiding the urban transportation vehicle, for example, by the intermediary of two guide rollers inclined in a V shape from a guide arm of the front of a trolley train on tires, and simultaneously or exclusively from the ground-level electrical energy collecting device.

[053] The guide rail 17 is affixed to each lacing by means of a support mounting 19 resting on a longitudinal support plate 20. This support assembly 19 can be

formed of a shaped receptor of bottom section 21, on which is supported the guide tie pad and two counter shaped sidewalls 22, with a section in the shape of an S, for laterally closing the base shape 21 and immobilizing the guide rail.

[054] The base shape 21 can be made from an elastomer, notably of rubber, in order to avoid a direct metal on metal contact and thus absorb vibration and noise.

[055] The upper parts of the counter-shaped sidewalls 22 in each case delimit between themselves and the guide rail, an intermediary space 23, in which it is possible to mold a synthetic material 24, for example, a resin, for filling the lower part of the guide rail 17 to ensure a good cohesion of the assembly and to play the role of a shock absorber. The resin 24 can advantageously be replaced by a filler joint 25, preferably tubular.

[056] The support assembly 19 is attached to each of the lacings 16 by means of guide rail clips or retaining pieces 26 on its support, which on one side rests on the upper part of each longitudinal edge of the support plate 20, and on the other, on the base of the counter shaped sidewalls 22. The assembly formed of the retaining piece 26, the support plate 20, and the lacing 16 being traversed by locking pins 27.

[057] The guidance assembly with collector or collector alone, carried by the vehicle rolling in the lane, could be of the type represented, that is, with two guide rollers 18 inclined in a pointed V with the point directed towards the bottom, with each roller, for example of the socket type rolling on one of the inclined faces of the head of the guide rail 17.

[058] The structure of the lane described above is made of prefabricated sections, connected to one another, for example, like the travel lane sections of a miniature train, or by an appropriate interface. These sections 1 are in the form of rectilinear components of variable length, preferably in the order of ten to twelve meters, and the curve components.

[059] The curve components can be made from the rectilinear elements which are bent into the appropriate curvature for a given installation. They can also be components of a smaller, variable size which have a shape that is more or less generally trapezoidal, which by successively juxtaposing them, enables the creation

of a segmented turn referred to as "facets" which satisfy the imperatives of the offset of the rear wheels.

[060] The framework assembly can be either fixed in a trench or installed by overlaying on already finished existing ground, for example, a roadway.

[061] When the lane according to the invention is installed in a trench, as with the variations represented in Figs. 7 to 12, it does not have to be installed on foundations or a concrete platform, as is the case with the earlier art. A simple preparation of the base 28 of the trench by compacting is sufficient, with the longitudinal caissons 3 supporting the weight of the vehicle and the effects related to rolling.

[062] The assembly is embedded up to a certain height in a backfill material 29, enabling an adequate immobilization of the framework. Advantageously, the depth of the trench and the height of the caissons are selected so that the rolling tracks 18 and the upper part of the guide rail 17 are effectively made level with the ground.

[063] The free intermediate space contained between the two rolling bands 8 is also filled with an appropriate backfill material 29. The entire system can be completed at the surface by a decorative or technical coating, or by a plant, grass or other parterre. This coating is preferably in the form of plates 30, for example, paving stones, slabs, tiles, or is sown with grass seed.

[064] In addition, the ground laterally bordering the lane according to the invention is surfaced-coated, for example, by a coat of bitumen if the lane is embedded in the roadway, or by a technical or decorative coating 31 of some kind that can be installed locally as a platform.

[065] The travel lane sections according to the invention are designed to be installed in an urban environment. They are not necessarily installed in reserved zones, and must be able to be crossed by regular road vehicles at level by means of installed crossings. In these zones, the surface covering must be selected in an appropriate manner to fulfill this function, and notably to support the weight of possible truck traffic. They could for example be paving stones, concrete slabs or other.

[066] Figs. 1 to 6 illustrate a variation of the lane section according to the invention designed to be directly installed on a roadway, or pre-existing, more or less regular finished ground.

[067] The travel lane is thus elevated in relation to the ground. So that this overlaying is not too significant, the shaped caissons 3 are preferably shorter then those of the variation designed to be buried.

[068] In addition, the exterior lateral wall 5 of each caisson 3 is preferably inclined so as to improve their bedding and to create a progressive slope toward the ground, thus conferring on the shaped caissons 3 a section shape that is more or less trapezoidal.

[069] The modular sections of the lane according to the invention are immobilized in the ground by means of bands of resin 32 sunk longitudinally in the ground within the longitudinal anchoring forms 33, two of which arm the sub-face of the caissons 3, and a third is connected to the lower face of the tie plate lacings 16 and extend transversally to these latter, under the rail 17.

[070] These anchoring forms 33, preferably made of formed steel, have the shape of an inverted gutter with the section that is more or less an open rectangle facing down. It is anchored in the resin 32 so as to totally immobilize the lane section. Casting the resin on site results in filling of the pre-existing irregularities in the ground.

[071] As in the case of the variation previously described, the intermediary free space between the two rolling bands is filled with an appropriate fill material 29, that is then surfaced-dressed with a decorative or technical coating, preferably in the form of plates 30.

[072] Locations for crossing by the road vehicle lanes can also be established. In these locations, the surface coatings are chosen in the appropriate manner to support the weight of vehicles. Graduated ramps can also be provided at these levels on either side of the lane section to enable road vehicles to reach the level of the lane and to re-descend from it so as to bridge the crossing with ease.

[073] A last variation of the invention is represented in Figs. 13 and 14. This is a

lane section equipped with more than one ground level electrical collection device. This device, which is simultaneously protected by the applicant, will thus be only briefly described.

[074] This ground-level electrical energy collecting device consists of a collection shoe 33 (similar to a third rail shoe) attached to the vehicle, which has preferably at its lower extremity, conductive parts that are connected electrically to the vehicle's feed circuit.

[075] In addition, it includes to linear polar parts 34 mounted in two holder shapes 35 located side-by-side, and carried by a carrier shaped support 36 with a more or less flat base and two lateral walls. Each of these holders 35 is provided over its length with elastic recall toward its adjacent counterpart by a linearly compressible mechanism 37 housed between each holder 35 and the corresponding lateral wall of the carrier shaped support 36.

[076] In this variation, each of the tie plate lacings 16 has a transverse housing 38 open to receive the carrier shaped support 36.

[077] In order to let the collections shoe 33 pass, the guide rail 17 is formed out into semi-rails 39 which can advantageously be equipped with a linear insulation protection 40 as a cover which opens locally by the passage of the shoe, for example, by separating it.

[078] The invention is obviously not limited to the preferred implementation methods described above and represented, but also includes all the numerous variations and modifications belonging to the same inventive concept that a person skilled in the art would be capable of imagining without difficulty.

[079] Thus for example, we have described and represented travel lane sections in general by plan and horizontal illustration. One could equally envisage the realization of a lane which, viewed in cross-section, would be inclined like a "circumflex accent" in the manner of many roadways, which would improve the runoff of rainwater on the sides and limit the formation of glaze ice.